CLAIMS

I claim:

1.   A method of interworking between a plurality of customer edge (CE) devices correspondingly coupled to provider edge (PE) devices via attachment circuits (ACs), the PE devices for routing packets across a service provider (SP) network, the CE devices including one or more Ethernet CE devices and at least one non-Ethernet CE, the method comprising:

providing a virtual switch instance (VSI) on a first PE device coupled to the at least one non-Ethernet CE, the first PE device also including a virtual routing forwarding (VRF) entity;

interfacing the VSI with the VRF entity such that the SP network appears to offer Layer 3 virtual private network (L3VPN) service toward the at least one non-Ethernet CE, and virtual private local area network service (VPLS) toward the one or more Ethernet CE devices.

2.   The method of claim 1 wherein the VSI and VRF entity comprise a single integrated entity.

3.   The method of claim 1 wherein the VSI and VRF entity comprise separate forwarding tables.

4.   The method of claim 1 wherein the VSI comprises forwarding tables for population with media access control (MAC) addresses of the CE devices.

5.   A method of providing virtual private network (VPN) service to a customer having a plurality of sites, one or more of the sites having Ethernet interfaces and at least one site having a non-Ethernet routed interface, each of the sites being connected across a service provider (SP) network via a corresponding provider edge (PE) device, the method comprising:

providing a logical entity on a PE device connected to the at least one site, the logical entity:

adding an Ethernet header to a Layer 3 packet for transport across the SP network to a destination site; and

delivering a packet at Layer 3 to the site having the non-Ethernet routed interface.

6.   The method of claim 5 wherein the site is connected to the PE device via an asynchronous transfer mode (ATM) type of attachment circuit (AC).

7.   The method of claim 5 wherein the site is connected to the PE device via a frame relay (FR) type of attachment circuit (AC).

8.   The method of claim 5 wherein the logical entity comprises separate virtual switch instance (VSI) and virtual routing forwarding (VRF) tables.

9.   The method of claim 5 wherein the logical entity comprises a single combined virtual switch instance (VSI) / virtual routing forwarding (VRF) table.

10.   A multi-tiered virtual private network (VPN) comprising:

a first tier that includes a plurality of provider edge (PE) devices providing virtual private local area network service (VPLS) functionality to customer edge (CE) devices having Ethernet interfaces; and

a second tier that includes one or more PE devices providing Layer 3 virtual private network (L3VPN) functionality, the one or more PE devices including a virtual routing forwarding (VRF) entity, and a virtual switch instance (VSI) interfaced that emulates a bridged local area network (LAN) segment.

11.   The multi-tiered VPN of claim 10 wherein the VSI and VRF entity comprise a single combined entity.

12.   The multi-tiered VPN of claim 10 further comprising a service provider (SP) network providing connectivity between the first tier PE devices.

13.   The multi-tiered VPN of claim 10 wherein the VSI and VRF entity comprise separate forwarding tables.

14.   The method of claim 10 wherein the VSI and VRF entity comprise forwarding tables for population with media access control (MAC) addresses of the CE devices.

15.   A provider edge (PE) device for connection to a service provider (SP) network and a customer edge (CE) device having a non-Ethernet interface comprising:

a virtual switch instance (VSI);

a virtual routing forwarding (VRF) entity configured with the VSI such that the SP network effectively offers Layer 3 virtual private network (L3VPN) service toward the at least one non-Ethernet CE, and virtual private local area network service (VPLS) toward the one or more Ethernet CE devices.

16.   The PE device of claim 15 wherein the VSI and VRF entity comprise a single combined entity.

17.   The PE device of claim 15 wherein the VSI and VRF entity comprise separate forwarding tables.

18.   The PE device of claim 10 wherein the VRF entity comprises a plurality of forwarding tables.

19.   A provider edge (PE) device for association with a customer edge (CE) device having a non-Ethernet routed interface, comprising:

a virtual switch instance (VSI) for connection to a service provider (SP) network, the VSI providing an Ethernet-compatible interface to the SP network;

a virtual routing forwarding (VRF) entity configured with the VSI to deliver Layer 3 virtual private network (L3VPN) compatible packets toward the CE, the VFR adding an Ethernet header to packets sent by the CE for transport across the SP to a destination customer site.

20.   The PE device of claim 19 wherein the VSI and VRF entity comprise a single combined entity.

21.   The PE device of claim 19 wherein the VSI and VRF entity comprise separate forwarding tables.

22.   The PE device of claim 19 wherein the VRF entity comprises a plurality of forwarding tables.

23.   A provider edge (PE) device for association with a customer edge (CE) device having a non-Ethernet routed interface, comprising:

means for providing an Ethernet-compatible interface for connection to a service provider (SP) network;

means for delivering Layer 3 virtual private network (L3VPN) compatible packets to the CE, and for adding an Ethernet header to packets sent by the CE for transport across the SP to a destination customer site.

24.   The PE device of claim 23 wherein the means for providing an Ethernet-compatible interface comprises a virtual switch instance (VSI).

25.   The PE device of claim 23 wherein the means for delivering Layer 3 virtual private network (L3VPN) compatible packets to the CE comprises a virtual routing forwarding (VRF) entity.

26.   The PE device of claim 25 wherein the VRF entity comprises one or more forwarding tables.

27.   A provider edge (PE) device for association with a customer edge (CE) device having a non-Ethernet routed interface, comprising:

means for providing an Ethernet-compatible interface for connection to a service provider (SP) network;

means for adding an Ethernet header to packets sent by the CE for transport across the SP to a destination customer site.

28.   The PE device of claim 27 wherein the means for providing an Ethernet-compatible interface comprises a virtual switch instance (VSI).

29. The PE device of claim 28 wherein the means for adding an Ethernet header to packets sent by the CE comprises a virtual routing forwarding (VRF) entity.

30. The PE device of claim 25 wherein the VRF entity comprises one or more forwarding tables.

31. A computer program product comprising a computer useable medium and computer readable code embodied on the computer useable medium, execution of the computer readable code causing the computer program product to:

provide an Ethernet-compatible interface on a provider edge (PE) device connected to a service provider (SP) network and to a customer edge (CE) device having a non-Ethernet routed interface;

deliver Layer 3 virtual private network (L3VPN) compatible packets from across the SP network to the CE device; and

add an Ethernet header to packets sent by the CE device for transport across the SP network to a destination device.

32. The computer program product of claim 31 wherein execution of the code causes the PE device to provide virtual private local area network service (VPLS) functionality for the CE device.